

WHAT IS CLAIMED IS:

1. A polishing slurry comprising:
 - (a) from about 2.5 to about 70% by volume of a silica sol that
5 contains from about 15 to about 40% by weight of SiO_2 particles having a mean particle size of less than 300 nm, and
 - (b) from about 6 to about 10% by volume of hydrogen peroxide and a base in an amount that is sufficient to set the pH of the polishing slurry at a pH at 22°C ranging from about 5 to about 11.5.
- 10 2. The polishing slurry of Claim 1, wherein the silica sol contains from about 20 to about 35% by weight of SiO_2 .
3. The polishing slurry of Claim 1, wherein the silica sol contains from about 25 to about 35% by weight of SiO_2 .
- 15 4. The polishing slurry of Claim 1, wherein the silica sol contains from about 28 to about 32% by weight of SiO_2 .
5. The polishing slurry of Claim 1, wherein the silica sol contains about 30% by weight of SiO_2 .
6. The polishing slurry according to Claim 1, wherein the slurry contains from about 1 to about 21.5% by weight of SiO_2 .
- 20 7. The polishing slurry according to Claim 1, wherein the slurry contains from about 8 to about 10% by volume of hydrogen peroxide.
8. The polishing slurry according to Claim 1, wherein the slurry contains potassium hydroxide as a base.
9. The polishing slurry according to Claim 1, wherein the slurry
25 has a pH at 22°C ranging from about 6 to about 10.
10. The polishing slurry of Claim 1, wherein the slurry has a Ta removal rate more than about 300 Å/min, a Cu:Ta selectivity that is more than about 1:2 and a Cu:dielectric selectivity of that is more than about 1:1 or greater, wherein the removal rate of the Ta is ≥ 1.15 times the removal
30 rate of a dielectric that can be polished by the polishing slurry.
11. A polishing slurry comprising:

(a) from about 2.5 to about 70% by volume of a silica sol containing SiO₂ particles, and

(b) from about 6 to about 10% by volume of hydrogen peroxide and a base in a quantity that is sufficient to set the pH of the polishing
5 slurry at a pH at 22°C ranging from about 5 to about 11.5,

wherein the slurry has a Ta removal rate more than about 300 Å/min, a Cu:Ta selectivity that is more than about 1:2, and a Cu:dielectric selectivity of that is more than about 1:1 or greater, wherein the removal rate of the Ta is ≥ 1.15 times the removal rate of a dielectric that can be
10 polished by the slurry.

12. The slurry of Claim 11, wherein the SiO₂ particles have a mean particle size of less than about 300 nm and the silica sol contains from about 15 to about 40% by weight of SiO₂.

13. The polishing slurry of Claim 12, wherein the silica sol
15 contains from about 20 to about 35% by weight of SiO₂.

14. The polishing slurry of Claim 12, wherein the silica sol contains from about 25 to about 35% by weight of SiO₂.

15. The polishing slurry of Claim 12, wherein the silica sol contains from about 28 to about 32% by weight of SiO₂.

20 16. The polishing slurry of Claim 12, wherein the silica sol contains about 30 by weight of SiO₂.

17. A method comprising polishing a substrate with a polishing slurry comprising:

(a) from about 2.5 to about 70% by volume of a silica sol that
25 contains 15 to 40% by weight of SiO₂ and is stabilized by H⁺ or K⁺ ions, the SiO₂ particles having a mean particle size of less than 300 nm, and

(b) from about 6 to about 10% by volume of hydrogen peroxide and a base in a quantity which is sufficient to set the pH of the polishing slurry at a pH at 22°C ranging from about 5 to about 11.5,

30 wherein the substrate is selected from the group consisting of Al substrates, Ru substrates, Pt substrates, Ir substrates, Cu substrates, Ta substrates, Ti substrates, Si substrates, W substrates, substrates

comprising of alloys of the foregoing, nitride substrates, carbide substrates, oxide substrates, carbonitrides substrates, oxynitride substrates, oxycarbide substrates oxycarbonitrides substrates, and combinations thereof.

18. A method comprising polishing a substrate with a polishing
5 slurry comprising:

(a) from about 2.5 to about 70% by volume of a silica sol which contains 15 to 40% by weight of SiO_2 and is stabilized by H^+ or K^+ ions and the SiO_2 particles of which have a mean particle size of less than 300 nm, and

10 (b) from about 6 to about 10% by volume of hydrogen peroxide and a base in a quantity which is sufficient to set the pH of the polishing slurry at a pH at 22°C ranging from about 5 to about 11.5,

wherein the substrate is selected from the group consisting of, polyimide substrates, fluorinated polyimide substrates, diamond-like
15 carbon substrates, polyarylether substrates, polyarylene substrates, parylene N substrates, cyclotene substrates, polynorbonene substrates, silsesquioxanes substrates and SiO_2 glass substrates.

19. A method comprising polishing a semiconductor, an integrated circuit or a microelectro-mechanical system with a polishing
20 slurry comprising:

(a) from about 2.5 to about 70% by volume of a silica sol that contains about 15 to 40% by weight of SiO_2 and is stabilized by H^+ or K^+ ions, the SiO_2 particles having a mean particle size of less than 300 nm, and

25 (b) from about 6 to about 10% by volume of hydrogen peroxide and a base in a quantity which is sufficient to set the pH of the polishing slurry at a pH at 22°C ranging from about 5 to about 11.5.

20. A method for preparing a polishing slurry comprising mixing from about 2.5 to about 70% by volume of a silica sol which
30 contains 15 to 40% by weight of SiO_2 , is stabilized by H^+ or K^+ ions and the SiO_2 particles of which have a mean particle size of less than 300 nm, 6 to

10% by volume of hydrogen peroxide and a base in a quantity which is appropriate to set the pH at 22°C of the polishing slurry to from 5 to 11.5, wherein the hydrogen peroxide is added last.